USER'S MANUAL OF THE COMPACT MCKT-HPX AHU'S AUTOMATIC CONTROLLER

SERVICE
Tel.: (+48 58) 783 99 50/51
Fax: (+48 58) 783 98 88
Mobile: (+48) 510 098 081
Email: serwis@klimor.pl

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1. INTRODUCTION

1.1 Description of Control System

The control system is specifically designed for MCKT-HPX refrigerating units An advanced control algorithm, using up to 5 temperature sensors in total, enables highly efficient heat recovery from the air extracted from rooms. Application of motors controlled by inverters/RPM controllers ensures adjustment of fan rotations in a stepless way within the entire control range.
Modular construction and several variable parameters ensure that the system supports both the heat pump as well as optional dampers and electrical or water heater.
Clear room panel enables communication between an user and the control system installed in the MCKT-HPX. A small and aesthetically manufactured panel can be located in any room which facilitates its operation and improves the comfort of usage. The application of the MODBUS RTU protocol enables connecting the controller to the facility BMS system and remote control and adjustment of the refrigerating unit.
Optional converter enables remote control of the MCKT-HPX AHU using a smartphone, tablet or PC.

1.2 Functions of control system

The control system is in charge of the following functions:
- 230VAC/400V power supply
- power supply, protection and control of fan motors and heat pump compressor and water heat's circulation pump
- RMC-20 panel power supply
- MODBUS communication interface
- 4× analog outputs 0÷10V
- 8× digital non-voltage relay outputs, switchable
- 5× digital temperature sensor inputs
- 4× digital non-voltage inputs
- 2× quick tranzistorized outputs (PWM)
- weekly calendar with possible 3 time zones for each day

1.3 Electrical protection

The control system has to be energized in accordance with the wiring diagram and has to be protected with a circuit breaker with an appropriate rating for the receivers used.
Protection of fans, heat pump compressor, compressor casing heater and water heater pump depend on their output and are provided on appropriate wiring diagrams.

1.4 Communication

The automatic control system enables communication with the BMS system using the MODBUS protocol.
Detailed information can be found in point 6.9 of the documentation.

The control system is equipped with an optional converter and enables management of the MCKT-HPX AHU via the web page from any place in the world. You can connect with the system using iPhone, iPad and a terminal with Android or Windows system.
Detailed information can be found in point 6.9 of the documentation.

2. SUPPORTED DEVICES

2.1 Fans

The control system enables independent control using 0÷10V voltage signals of air supply and air exhaust fans equipped with 1-phase EC motors for MCKT-HPX1 and 3-phase (3x230V) AC with inverters for MCKT-HPX2 and MCKT-HPX3. It also ensures power supply and protection of each of the fans individually.

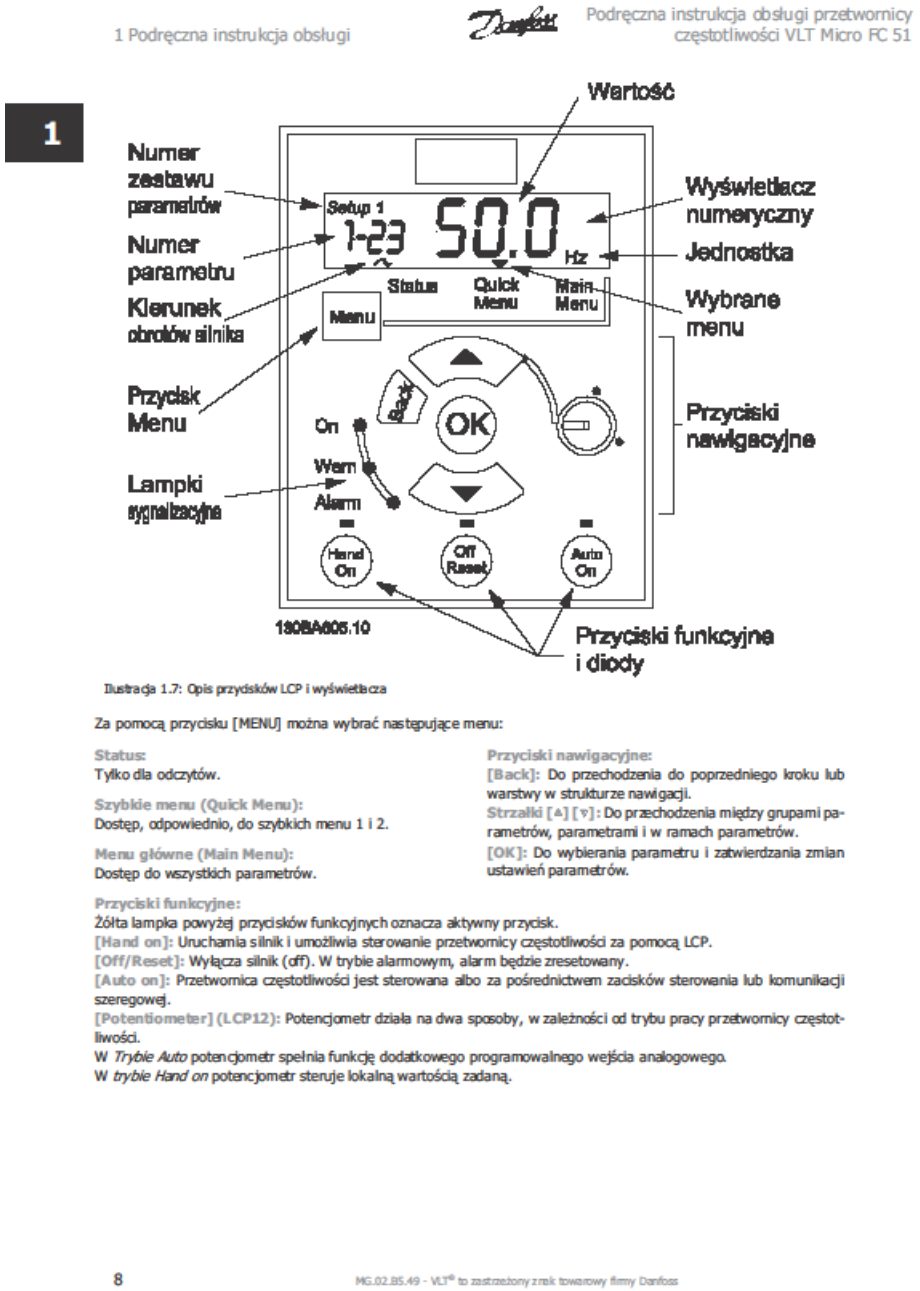
2.1.1 RPM adjustment of MCKT-HPX1 fan motors

The controller provides a 0×10V signal directly to the EC motor.

2.1.2 RPM adjustment of MCKT-HPX 2 and 3 fan motors

The controller provides a 0×10V signal to the inverter which in a proportional way changes frequency of the fan motor current.
AHUs are equipped with inverters with 1×230V/50Hz power supply, which control fan motors powered with 3x230V/50Hz. Each inverter is equipped with control panel shown below. The inverter user manual is provided in the attachment.

Picture no. 1 Inverter control panel for the MCKT-HPX 2 and 3



Ilustracja 1.7: Opis przycisków LCP i wyświetlacza

Za pomocą przycisku [MENU] można wybrać następujące menu:

Status:
Tylko dla odczytów.

Szybkie menu (Quick Menu):
Dostęp, odpowiednio, do szybkich menu 1 i 2.

Menu główne (Main Menu):
Dostęp do wszystkich parametrów.

Przyciski nawigacyjne:
[Back]: Do przechodzenia do poprzedniego kroku lub warstwy w strukturze nawigacji.
Strzałki [▲] [▼]: Do przechodzenia między grupami parametrów, parametrami i w ramach parametrów.
[OK]: Do wybierania parametru i zatwierdzania zmian ustawień parametrów.

Przyciski funkcyjne:
Żółta lampka powyżej przycisków funkcyjnych oznacza aktywny przycisk.
[Hand on]: Uruchamia silnik i umożliwia sterowanie przetwornicy częstotliwości za pomocą LCP.
[Off/Reset]: Wyłącza silnik (off). W trybie alarmowym, alarm będzie zresetowany.
[Auto on]: Przetwornica częstotliwości jest sterowana albo za pośrednictwem zacisków sterowania lub komunikacji szeregowej.
[Potentiometer] (LCP12): Potencjometr działa na dwa sposoby, w zależności od trybu pracy przetwornicy częstotliwości.
W *Trybie Auto* potencjometr spełnia funkcję dodatkowego programowalnego wejścia analogowego.
W *trybie Hand on* potencjometr steruje lokalną wartością zadaną.

MG.02.B5.49 - VLT® to zastrzeżony znak towarowy firmy Danfoss

Picture no. 2 Description of inverter control panel for the MCKT-HPX 2 and 3

2.2 Cross-flow heat exchanger

The control system manages defrosting of the cross-flow exchanger. When the controller receives a signal from the temperature sensor (B3) installed at the exchanger's air exhaust outlet regarding a drop of this temperature below the setting (factory default: 0°C), it reduces the air supply fan RPM in a stepless way down to the pre-programmed min value. Once the problem disappears (temperature rises above the setting) the air supply fan RPMs come back to the set value.

2.3 Heat pump

The control system contains a complete algorithm of heat pump control with reverse operation option.
It covers the following functions:

- Turning on/off the compressor
- Turning on/off the solenoid valve controlling the compressor
- Turning on/off the 4-way valve switching the system operation
- Read out of high pressure gauge alert
- Read out of low pressure gauge alert
- Controlling the compressor casing heater

The MCKT-HPX AHU can be equipped with the preliminary electrical heater (**optional)**, which heats up fresh air and ensures correct operation of the heat pump at low external temperatures (below -5°C).

2.4 Filters

The pressure gauges installed at filters indicate filter contamination and the need to replace them. When excessive pressure drop on any of the filters is detected an alarm signal is displayed.
It is necessary to plan filter exchange/cleaning. The system should not operate for a longer with contaminated filters as it can cause damage of the heat pump and/or fans' motors.

2.5 Optional devices

The MCKT-HPX control systems enable control of other devices which are not provided as standard AHU equipment. They contain:

2.5.1 Preliminary water heater with 3-way control valve with actuator. The heater is protected against freezing by the B5 temperature sensor which is located at the heater return line and it is possible to energize its circulating pump (1x230V up to 500W). Configuration of the heater supply node – attached.

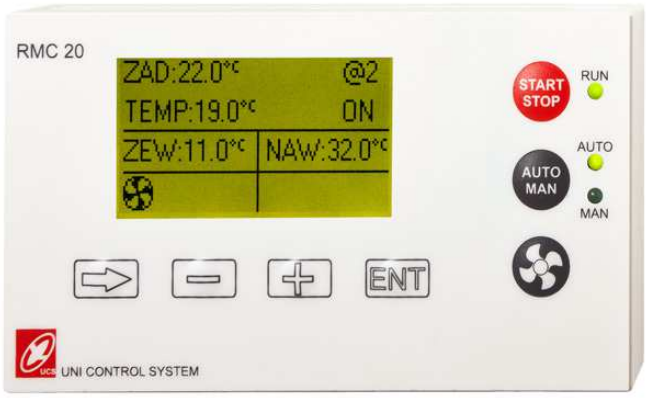
2.5.2 Preliminary electrical heater energized and controlled using a separate module. Power supply of the heater to MCKT-HPX1 – 1×230V/50Hz, to MCKT-HPX2,3 – 3×400V/50Hz. Heaters electrical data – attached.

2.5.3 Inlet and outlet dampers with on-off controlled actuators, and in case of the MCKT-HPX unit equipped with the preliminary water heater – air supply damper with actuator with a return spring.

2.5.4 Converter enabling management of the MCKT-HPX unit via Internet

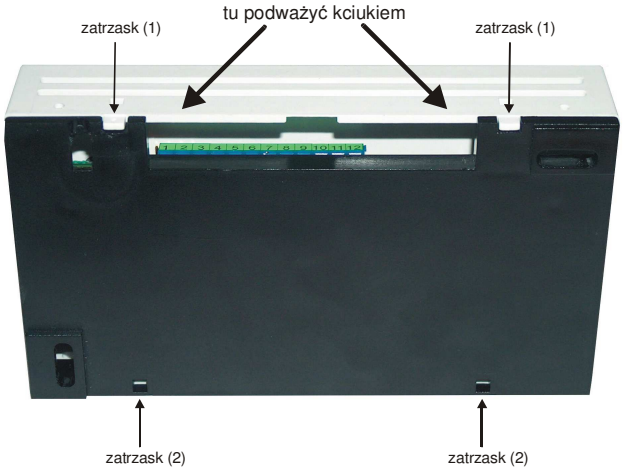
3. RMC 20 CONTROL PANEL

The main element dedicated to communication with the control system controller is the RMC 20 panel. It is also possible to control the unit via BMS in the MODBUS protocol.



Picture no. 3 View of the control panel

3.1 Assembly and connection of the RMC20 panel



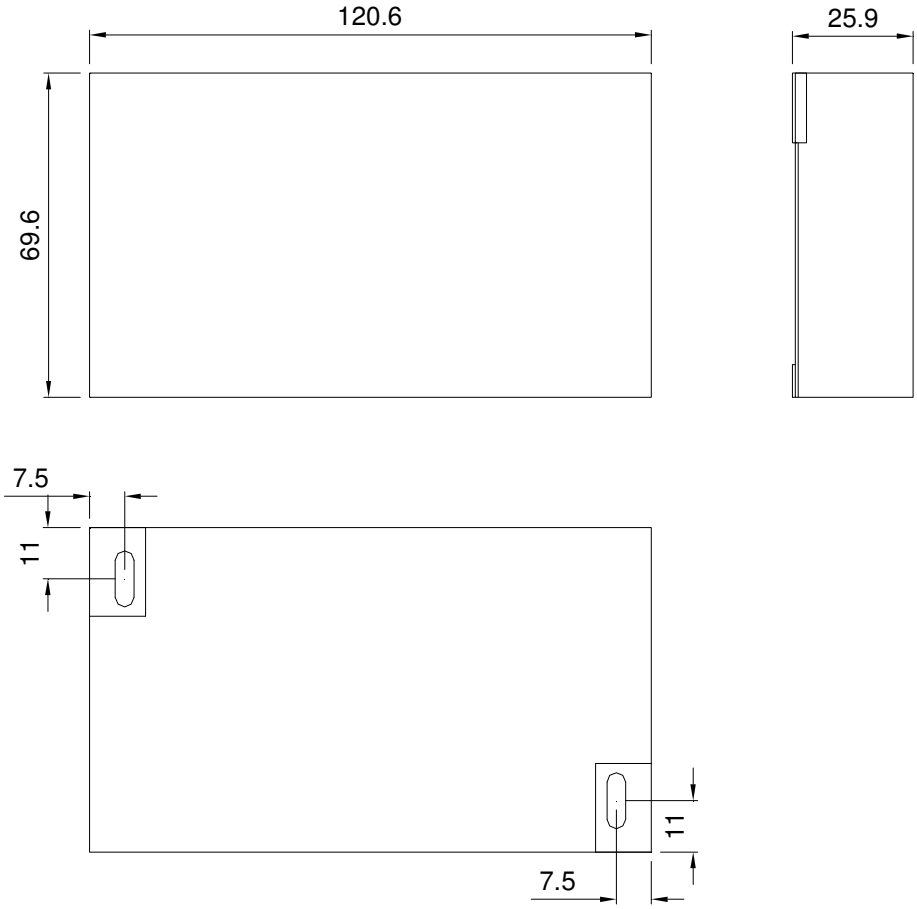
Picture no. 4 Back view of the control panel

In order to have access to the panel terminal strip, pry carefully the cover with your thumb near the latches (1) (see the picture) and then remove it from the latches (2), sliding it backward.
Once the cover is open you can carefully remove the keyboard ribbons from connectors, holding the black terminal.
Do not pull the ribbons because it may cause problems with proper contact between connectors and in the result the buttons would not operate.
Note: The warranty does not cover a mechanical damage of the keyboard ribbon.

Once the cables are connected reinsert the keyboard ribbon into the connector, holding the black terminal. Make sure not to miss any connector's terminal.
In order to close the cover slide it inclined into back latches (2) and close its front part, pushing it down. When closing the cover the display opening edge may contact the display. Please push a bit harder and the display will pass the opening.
While connecting the panel to the controller make sure not to swap the G0 ground with the G phase in one of the devices.
Swapping these leads in one of the devices will lead to shorting between the G and G0 by the RS485 output and its damage.

The 24 VAC power supply should be connected as follows:
- The G0 ground should be connected to the terminal **1** and the G phase to the terminal **2**

The cable: Use shielded 4x0.5 mm^2 cable to connect the panel. Maximum cable length between the panel and device should not exceed 30 meters.



Picture 5 Panel diameters

The panel (panel's back plate) has to be fixed to the wall with two ∅3 mm screws, through two oval holes.

3.2 RMC20 panel operation

3.2.1 List of displayed symbols

Symbol	Description
	Operation of the fans A number beside this symbol indicates the fans' RPM or speed (percentage setting according to point 8.12)
	Heating indication
	Cooling indication
	The heat exchanger is included in the ventilation circuit
	The bypass module is turned on and the heat exchanger is excluded from the ventilation circuit
	Filter contamination indication This symbol appears 3 months after starting the AHU operation to inform about requited filters' replacement. Once the filters are replaced use the RESET button located at the controller inside the AHU in order to reset the fan operation timer.
☼	Indication of the exchanger defrosting process

3.2.2 Functional buttons

Function buttons located on the panel:

START/STOP: switching on or off the AHU

AUTO/MAN: switching automatic or manual operation mode

NOTE: In order to turn on or off the AUTO/MAN mode press and hold the "AUTO/MAN" button for 4 seconds till an appropriate LED is on.

The fan speed change button:
Press once to initiate blinking if fan speed field. Each next pressing increases the fan speed by one level up. Once the maximum level is reached the mode switches back to the first speed. In order to complete changes press the button

to stop blinking or leave the blinking field which turns off after 30 seconds.

3.2.3 ALARM LIST

No.	Full name	Displayed message	Results
1	Anti-frost alarm from the water heater	FROSTING ALARM	It turns off the fans (air supply and exhaust), opens at max the water heater valve. Once the alarm is cleared the system does not start automatically and it should be stared from the panel.
6	High temperature	HIGH TEMPERATURE	Turns off the electrical heaters. The system is operating.
7	Exchanger alarm	EXCHANGER ALARM	Reduces the air supply fan RPM The air exhaust is operational.
10	Contaminated filters		Only indication
22	Low compressor pressure	LOW PRESSURE	Turns off the compressor Automatic reset
23	High compressor pressure	HIGH PRESSURE	Turns off the compressor Automatic reset

NOTE!

1. The MCKT-HPX AHU is supplied with factory settings of individual parameters provided to the controller.
2. The user has to configure the system according to conditions in a facility where the MCKT-HPX is installed.
3. Changing most of the parameters entered by an user requires the password.
4. Reading all parameters and changing the „requested temperature" does not require entering the password.
5. If the change of „requested temperature" with programmed calendar zones – the changes applies ONLY in this zone, where the system is located. The change does not pass to the next zones and calendar days.

4. PRELIMINARY HEATER

In order to to ensure correct operation of the heat pump in the MCKT-HPX unit at external air temperature below -5°C it is recommended to use a preliminary heater installed at external air inlet to the AHU.
Electrical connection of heaters – according to diagrams in the attachments.
Connection to the control system of the control valve actuator and circulating pump – according to the diagram attached.

4.1 Electrical heater

It is energized and controlled by a separate control module.
MCKT-HPX 1 – 1x230V 20A power supply.
MCKT- HPX 2 i 3 – 3x400V power supply, 22.6A and 33.9A respectively.
Controller configuration – see the screen #8, RMC 20

4.2 Water heater

Controller configuration – see the screen #8, RMC 20
Connecting to the control system an additional, provided in bulk B5 temperature sensor and installing its probe at the heater's water outlet. This sensor protects the preliminary heater against freezing.

5. AIR DAMPERS

It is recommended to install on the external air side the dampers with actuators cutting out airflow of a non-operating unit.
ON/OFF controlled damper actuators
If the preliminary water heater is installed, the air supply damper actuator should be equipped with a return spring.
Electrical connection of actuators to the control system – according to diagrams in the attachments.

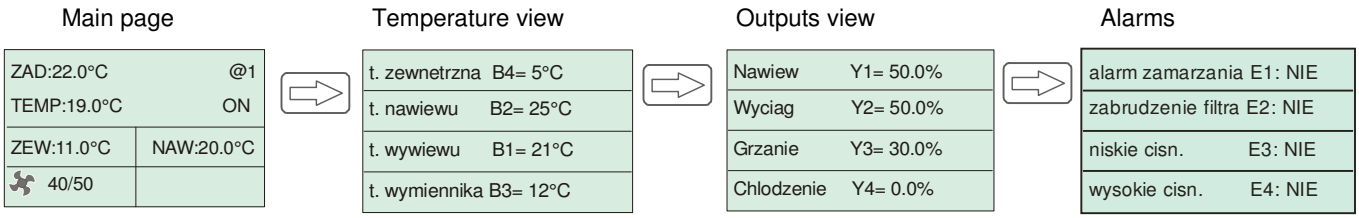
6. ATTACHMENTS:

The next pages of the manual contain information regarding:

- RMC20 panel operation
- Wiring diagram of MCKT-HPX1
- Wiring diagram of MCKT-HPX2
- Wiring diagram of MCKT-HPX3
- Wiring diagram of MCKT-HPX1 electrical heater's power supply module
- Wiring diagram of MCKT-HPX2 and 3 electrical heater's power supply module
- Diagram of water heater node
- Operation manual and wiring diagram of MCKT-HPX1 RPM regulator
- Quick programming guide for MCKT-HPX2 and 3 inverters
- BMS communication variable list
- Operation manual of the Internet converter

6.1 RMC20 PANEL OPERATION

6.1.1 Changing the display modes:



6.1.2 Changing the display menu page

Changing the display menu page with parameters is done by pressing which enables moving forward or which enables moving back.

To move back to the main display page change pages forward till the end or press , if you are not in the time zone menu.

6.1.3 Changing requested values

Press the ENT button on the main display page to change the settings.

The first settings filed starts blinking. You can then introduce changes using the buttons.

If you want to modify next settings go to the next item using the button.

Once all changes are introduced finalize the changes with the "ENT" button.

6.1.4 Remote alarms resetting

Main display page:

ZAD:22.0C	@1
TEMP:19.0C	ON
ZEW:11.0C	NAW:20.0C
50	

1. If the display is not changed at the #1 page shown above, press the or button till the #1 page is displayed.
2. Press the button and hold (for about 3 seconds) till the displayed alarm disappears.

6.1.5 Changing requested temperature value

Main display page:

ZAD:22.0C	@1
TEMP:19.0C	ON
ZEW:11.0C	NAW:20.0C
50	

1. If the display is not changed at the #1 page shown above, press the or button till the #1 page is displayed..
2. Press ENT . The value field in the ZAD filed starts blinking.
3. Press to increase or press to decrease a value. Hold the button pressed to speed up a value change.

4. Press ENT to finish. The set value stops blinking.

Press to move to the next requested value, i.e. fan RPM setting. The value field in the filed starts blinking.

6.1.6 Changing fan RPMs:

Main display page:

ZAD:22.0C	@1
TEMP:19.0C	ON
ZEW:11.0C	NAW:20.0C
50	

1. If the display is not changed at the #1 page shown above, press the [+] or [−] button as many times as necessary to display page #1.
2. Press . The value field in the filed starts blinking.

3. Press to increase the fan speed by one (percentage setting). Each next pressing of a button increases the fan speed and when the max speed is reached it switches back to the lowest one.
In order to set the fan RPMs in a stepless way in case of EC fans, press [+] to increase the value or [−] to decrease the value.
4. Press [ENT] to finish.

6.1.7 Entering operation schedule

The control panel has got integrated real time clock and it enables entering weekly schedule for AHU operation. For each week day you can enter up to three time zones and one manual program initiated by the AUTO button.

A) Entering a common zone for all weekdays [AUTO MAN]

Page #1 of the display (main page):

ZAD:22.0C	@1
TEMP:19.0C	ON
ZEW:11.0C	NAW:20.0C
50	

1. Press [+] as many times as necessary to display a zone which has to be set.

Strefa 1	@1
od 00.00 do 00.00	
TEMP: 22	
BIEG : 2	

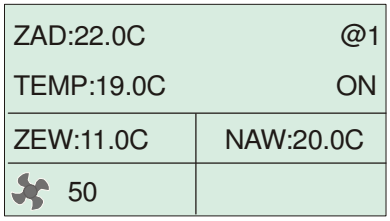
Page for time zone:
A zone name without a weekday name stands for a common zone for all weekdays. Changes implemented in this zone will be copied to an appropriate zone of all weekdays.

2. Press [ENT] The first position, i.e. zone starting hour starts blinking.
3. Enter starting hour of a time zone using the [+] [−] buttons.
4. Press [⇨] to move to the next filed, i.e. minutes or press [ENT] to finish.
5. Enter starting minutes of a time zone using the [+] [−] buttons.
6. Press [⇨] to move to the zone finish hour or press [ENT] to finish.
7. Enter finishing hour of a time zone using the [+] [−] buttons.
8. Press [⇨] to move to the zone finish minutes or press [ENT] to finish.
9. Enter finishing minutes of a time zone using the [+] [−] buttons.
10. Press [⇨] to move to the requested temperature in the zone or press [ENT] to finish.

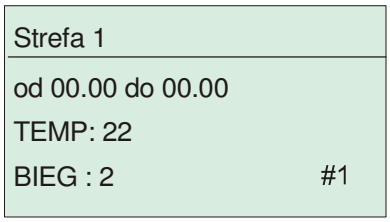
11. Enter a requested temperature using the [+] [−] buttons.
12. Press [→] to move to the fan speed settings in the zone or press [ENT] to finish.
13. Enter the fan speed using the [+] [−] buttons.
14. Press [ENT] to finish.

B) Entering zone for each day of a week

Page #1 of the display (main page):

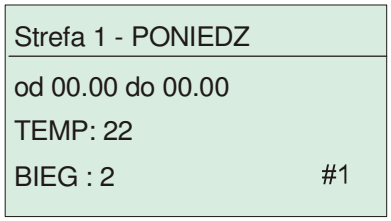


1. Press [+] as many times as necessary to display a zone which has to be set.



Page for time zone:
A zone name without a weekday name stands for a common zone for all weekdays. Changes implemented in this zone will be copied to an appropriate zone of all weekdays.

2. Press [→] as many times as necessary to display a weekday which has to be set.



Time zone for a given week day:
Changes introduced in this zone are related to this weekday only.
"Speed" means a configured percentage setting.

3. Press [ENT]. The first position, i.e. zone starting hour starts blinking.
4. Enter starting hour of a time zone using the [+] [−] buttons.
5. Press [→] to move to the next filed, i.e. minutes or press [ENT] to finish.
6. Enter starting minutes of a time zone using the [+] [−] buttons.
7. Press [→] to move to the zone finish hour or press [ENT] to finish.
8. Enter finishing hour of a time zone using the [+] [−] buttons.
9. Press [→] to move to the zone finish minutes or press [ENT] to finish.
10. Enter finishing minutes of a time zone using the [+] [−] buttons.
11. Press [→] to move to the requested temperature in the zone or press [ENT] to finish.
12. Enter a requested temperature using the [+] [−] buttons.
13. Press [→] to move to the fan speed settings in the zone or press [ENT] to finish.
14. Enter the fan speed using the [+] [−] buttons.
15. Press [ENT] to finish. If you would like to configure the next zone, repeat steps from point 1 to point 2.

6.1.8 Setting the clock

Page #1 of the display (main page):

ZAD:22.0C	@1
TEMP:19.0C	ON
ZEW:11.0C	NAW:20.0C
50	

1. Press [+] as many times as necessary to display the clock page.

ZEGAR
H:M=13.45
DZIEN:WTOREK
DATA: 21.05.2011 #5

The clock page:

H:M – hour: Minutes
DATE – day . month . year

2. Press [ENT]. The first position, i.e. hour starts blinking.
3. Enter the hour using the [+] [−] buttons.
4. Press [→] to move to the next filed, i.e. minutes.
5. Enter the minutes using the [+] [−] buttons.
6. Press [→] to move to a weekday.
7. Enter the weekday using the [+] [−] buttons.
8. Press [→] to move to a month day position.
9. Enter a month day using the [+] [−] buttons.
10. Press [→] to move to a month position.
11. Enter the month using the [+] [−] buttons.
12. Press [→] to move to a year position.
13. Enter the year using the [+] [−] buttons.
14. Press [ENT] to finish.

6.1.9 Parameters setting

6.1.9.1 Choice of application:

Display page:

Wybor aplikacji
AP: USER
Nastawy uytkownika
#6

1. Press + or − button to display the page shown above.
2. Press ENT button – the **AP** field starts blinking.
3. If you want to set the MAX parameter, press → .
4. Set a required value with + − buttons.
5. Press ENT to finish.

6.1.9.2 AHU settings

Once the user application is selected (the **AP** parameter set to **USER**), once the password is entered, you can edit the AHU configuration parameters.
Turn off the system using START STOP button before editing these parameters.

These parameters are locked while the system is operating.

Displayed pages:

Ustawienia centrali
Nagrzew.: wodna
Chlodnica: agregat
#7

Heater:
Heater type selection: water, electrical or no heater

Cooler: Cooler type selection: water, refrigerating unit or no cooler

Ustawienia centrali
Nagrz wstep: nie ma
Reg temp.: kaskad
#8

Preliminary heater:
Type of the preliminary heater: water, electrical or no preliminary heater
Temperature adjustment:
Type of adjustment: cascading or air supply adjustment

Recovery:
Type of recovery: cross-flow exchanger with bypass, cross-flow exchanger without bypass, recirculation (mixing chamber) or no recovery

Ustawienia centrali
Odzysk: krzyzowy
Zabezpiecz: B3
#9

Protection:
Exchanger protection: temperature sensor at the B3 input or pressure gauge at the E4 input.

Ustawienia centrali
Wentylator: reg. obr
Pompa ciepla: tak
#10

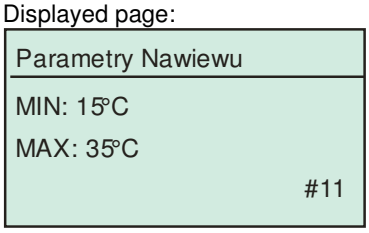
Fan:
Type of fan: inverter-controlled fan, 1, 2, 3 or 4-speed AC fan
Heat pump:
Selection of the heat pump control – YES

Parameters highlighted in red – required

6.1.10 Air supply parameters

Name	Default value	Range	Description
MIN	15°C	0 ÷ 66°C	Min air intake temperature
MAX	35°C	5 ÷ 70°C	Max air intake temperature

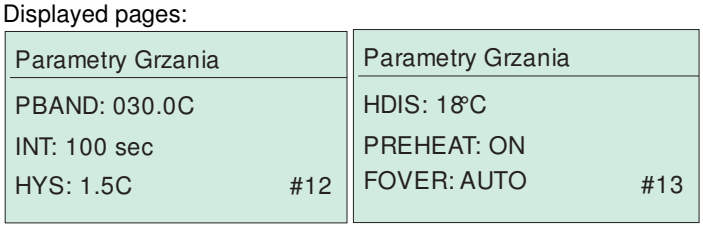
Displayed page:



1. Press or button to display the page shown above.
2. Press button – the **MIN** field starts blinking.
3. If you want to set the **MAX**, press .
4. Set a required value with buttons.
5. Press to finish.
   Press to move to the next parameter.

6.1.11 Heating parameters

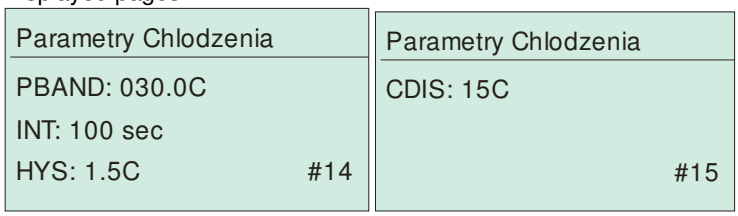
Displayed pages:



1. Press or button to display the required page shown above.
2. Press – the **PBAND** or **HDIS** field starts blinking.
3. If you want to set the next parameter, press .
4. Set a required value with buttons.
5. Press to finish.
   Press to move to the next parameter.

6.1.12 Cooling parameters

Displayed pages:



1. Press or button to display the page shown above.
2. Press – the **PBAND** or **CDIS** field starts blinking.
3. If you want to set the next parameter, press .

4. Set a required value with [+] [−] buttons.
5. Press [ENT] to finish.
   Press [⇨] to move to the next parameter.

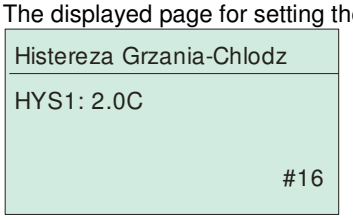
6.1.13 Heating/cooling hysteresis

Switching from the heating into cooling mode occurs once the heating is turned off and the leading temperature rises by the **HYS1 value** above the requested temperature.
Switching from the cooling into heating mode occurs once the cooling is turned off and the leading temperature drops by the **HYS1 value** below the requested temperature.

Name	Default value	Range	Description
HYS1	2.0°C	0.5 ÷ 9.9°C	Dead zone between heating and cooling:

Description of the heating/cooling hysteresis effect:

The displayed page for setting the heating/cooling hysteresis:



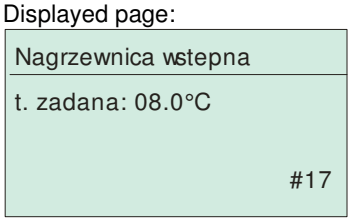
1. Press [+] or [−] button to display the page shown above.
2. Press [ENT] button – the **HYS1** field starts blinking.
3. Set a required value with [+] [−] buttons.
4. Press [ENT] to finish.

6.1.14 Preliminary heater

The preliminary heater installed upstream the exchanger ensures preliminary heating of air coming to the exchanger or heat pump. Requested temperature for this adjustment is determined by "requested temp." parameter.

Name	Default value	Range	Description
requested temp.	08.0°C	-5 ÷ 20°C	Requested temperature for the preliminary heater

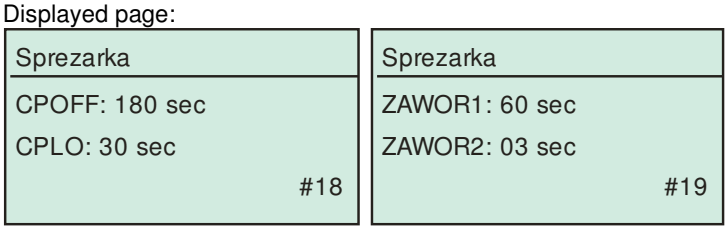
Displayed page:



1. Press [+] or [−] button to display the page shown above.
2. Press [ENT] button – the **Requested temp.** field starts blinking.
3. Set a required value with [+] [−] buttons.
4. Press [ENT] to finish.

6.1.15 Compressor:

Displayed page:

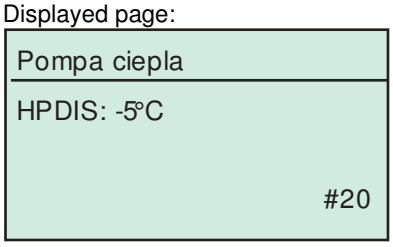


1. Press [+] or [−] button to display the page shown above.
2. Press [ENT] button – the **CPOFF** field starts blinking.
3. If you want to set the next parameter, press [⇨] .
4. Set a required value with [+] [−] buttons.
5. Press [ENT] to finish.
   Press [⇨] to move to the next parameter.

6.1.16 Turning off the heat pump in the external temperature function:

Name	Default value	Range	Description
HPDIS	-5.0°C	-15 ÷ -5°C	External temperature below which the heat pump is turned off.

Displayed page:



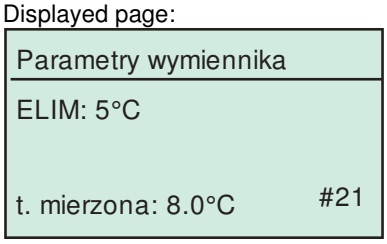
1. Press [+] or [−] button to display the page shown above.
2. Press [ENT] button – the **HPDIS** field starts blinking.
3. Set a required value with [+] [−] buttons.
4. Press [ENT] to finish.

6.1.17 Exchanger parameters

The **ELIM** parameter determines a min allowable temperature at the exchanger outlet. Temperature at the exchanger outlet is constantly monitored and the air supply fan RPMs are adjusted in a stepless way in order to ensure optimal temperature at the exchanger output. Eventually, if the air supply adjustment does not work and temperature drops below **ELIM** alarm level, the air supply fan is turned off and the defrosting cycle is started. Bottom line shows the current temperature at the exchanger outlet.

Name	Default value	Range	Description
ELIM	5°C	-10 ÷ +10°C	Alarm temperature for the exchanger

Displayed page:



1. Press [+] or [−] button to display the page shown above.

2. Press ENT button – the **ELIM** field starts blinking.
3. Set a required value with + − buttons.
4. Press ENT to finish.

6.1.18 Fans parameters:

Displayed pages:

Wentylatory	Wentylatory
FCOEF:1.00	START: 0 sec
FMIN:10%	STOP: 30 sec
FMOD:7°C #26	#27

1. Press + or − button to display the page shown above.
2. Press ENT button – the **FCOEF** field starts blinking.
3. Set a required value with + − buttons.
4. Press ENT to finish.
5. Press ⇨ to move to the next parameter.

6.1.19 Programming of the fan speeds:

Displayed pages:

Programowanie biegi	Programowanie biegi
SPD1: 25	SPD3: 75
SPD2: 50	SPD4: 100
#28	#29

1. Press + or − button to display the page shown above.
2. Press ENT – the **SPD1** or **SPD3** field starts blinking.
3. Set a required value with + − buttons.
4. Press ENT to finish.

   Press ...⇨..... to switch to the next parameter (**SPD2** or **SPD4**).

6.1.20 Language selection

Displayed page:

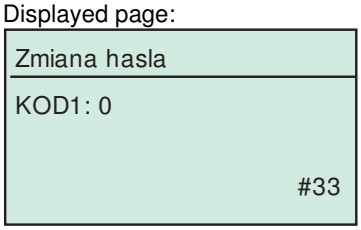
Wybor jezyka
JEZYK: POLSKI
#32

1. Press + or − button to display the page shown above.
2. Press ENT button – the **LANGUAGE** field starts blinking.
3. Set a required value with + − buttons.
4. Press ENT to finish.

6.1.21 Changing the password

You can set the password in order to prevent changing some parameters. Once the password is entered (all values other than zero) these parameters will be visible however you cannot change them if you are not logged. If the password is set as zero you can change the value without a need to log into.

Displayed page:

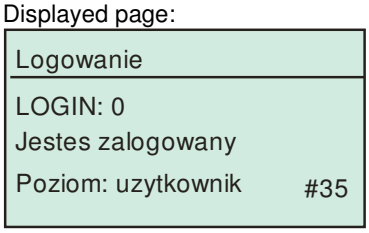


1. Press [+] or [−] button to display the page shown above.
2. Press [ENT] button – the **CODE** field starts blinking.
3. Enter new password using the [+] [−] buttons.
4. Press [ENT] to finish.

6.1.22 Logging into

Log into by entering the password in order to change some parameters.
Factory password: 0.

Displayed page:



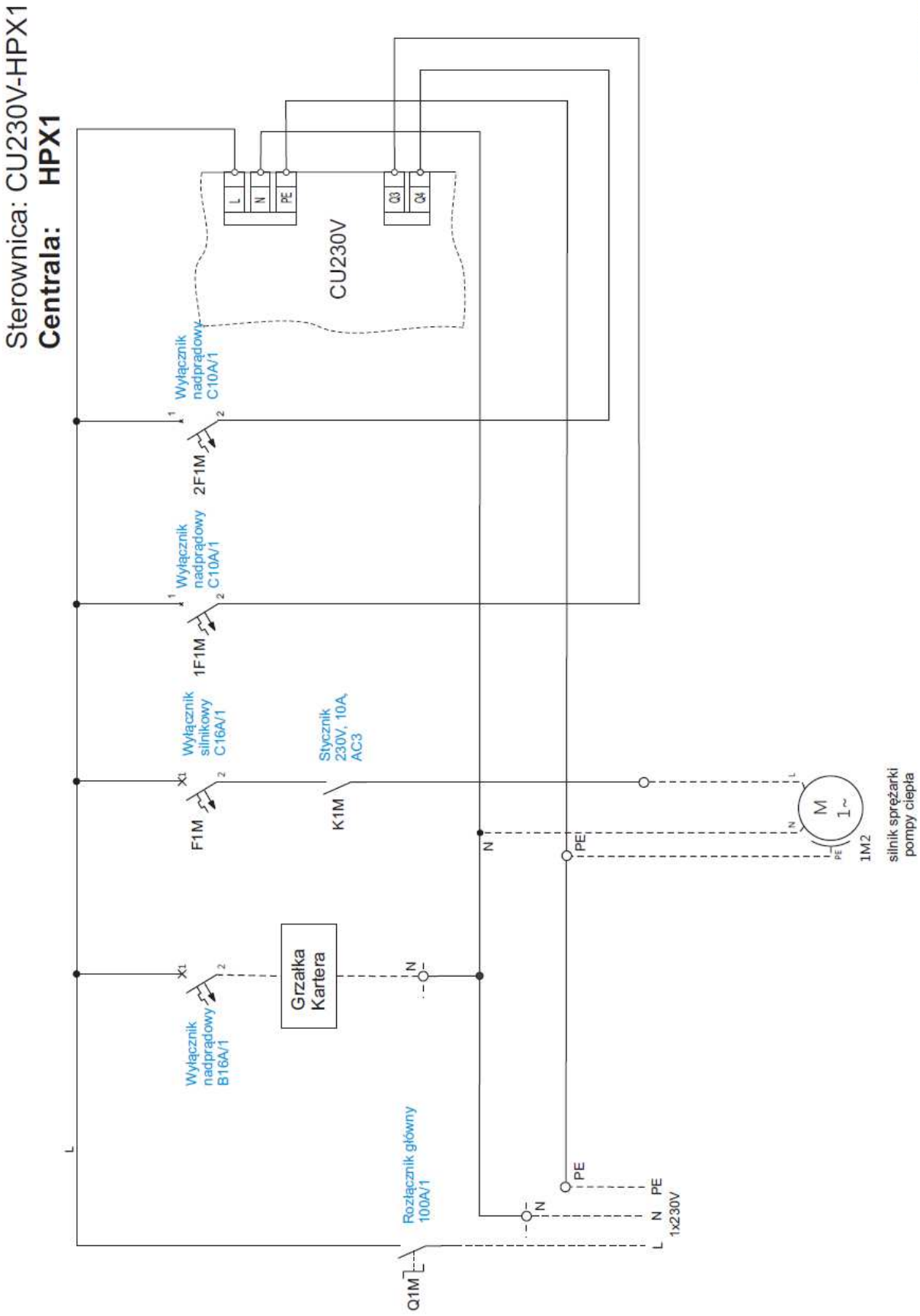
1. Press [+] or [−] button to display the page shown above.
2. This displayed page is the last one so you can access it directly by pressing [−] from the display main page level.
3. Press [ENT] button – the **LOGIN** field starts blinking.
4. Enter the password using the [+] [−] buttons.
5. Press [ENT] to confirm.

Note:
Due to high complexity level of the control system only the following parameters can be configured:

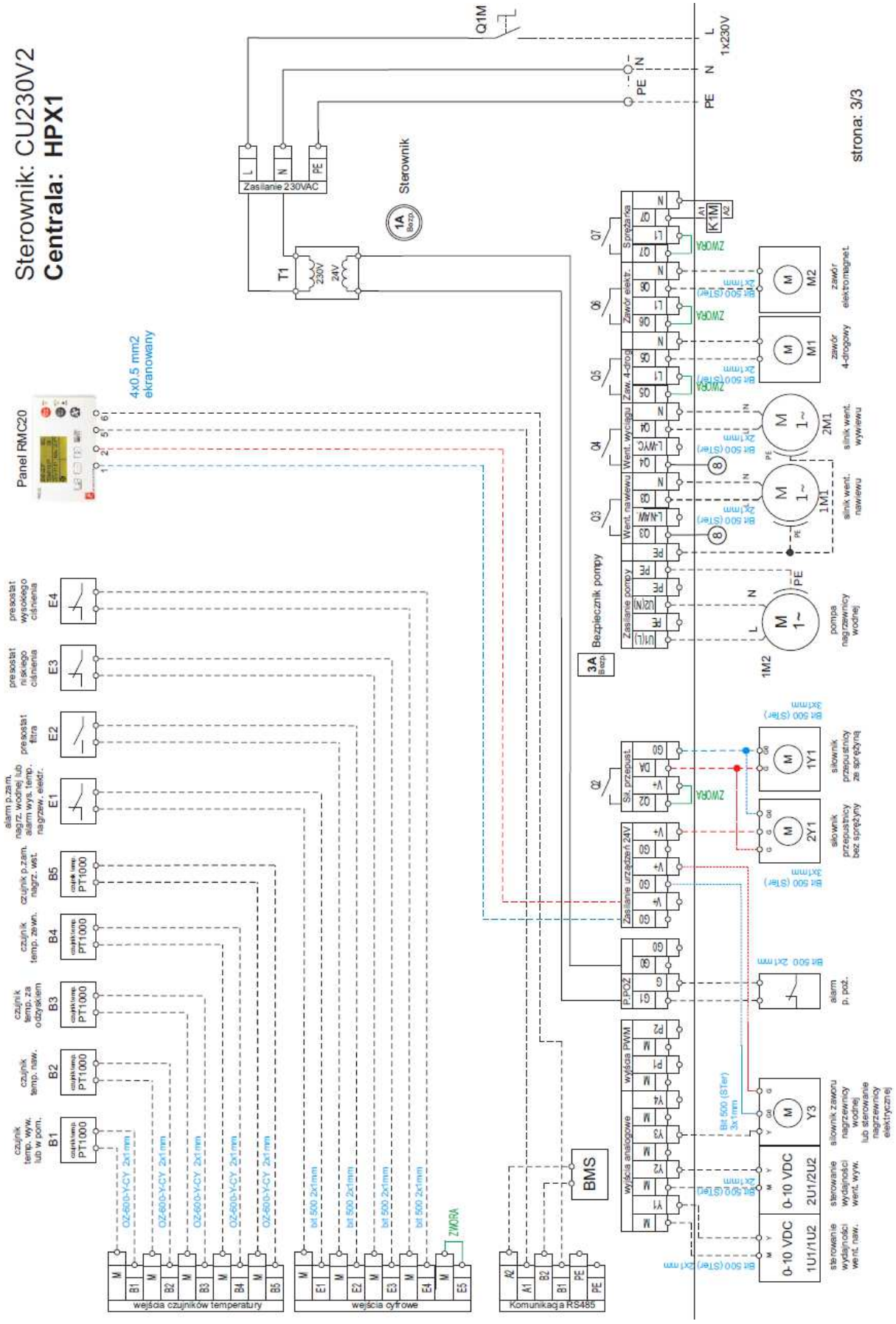
PKT 6.1.5 Changing the temperature requested value– allowable
PKT 6.1.6 Changing the fan RPMs – allowable
PKT 6.1.7 Entering the operation schedule – allowable
PKT 6.1.8 Setting the clock – allowable
PKT 6.1.9.2 AHU settings – preliminary heater: Preliminary heater parameter. (water heater, electrical heater, no heater) – allowable
PKT 6.1.10 Air supply parameters – max and min air supply temperature: max and min parameters – allowable
PKT 6.1.11 Heating parameters – external air temperature at which the AHU can operate in the heating mode: HDIS – allowable
PKT 6.1.12 Cooling parameters – external air temperature at which the AHU can operate in the cooling mode: CDIS – allowable
PKT 6.1.14 Preliminary heater – requested temperature: Requested temp. – allowable
PKT 6.1.16 Turning off the heat pump in the external temperature function: HPDIS – allowable
PKT 6.1.19 Fan speeds programming – SPD1, SPD2, SPD3, SPD4 – allowable
PKT 6.1.20 Language selection – allowable

Other parameters can be modified only based on the manufacturer permission.

6.2 Wiring diagram of MCKT-HPX1



Picture no. 6.1 MCKT-HPX1 wiring diagram



Picture no. 6.2 MCKT-HPX1 wiring diagram

6.3 Wiring diagram of MCKT-HPX2

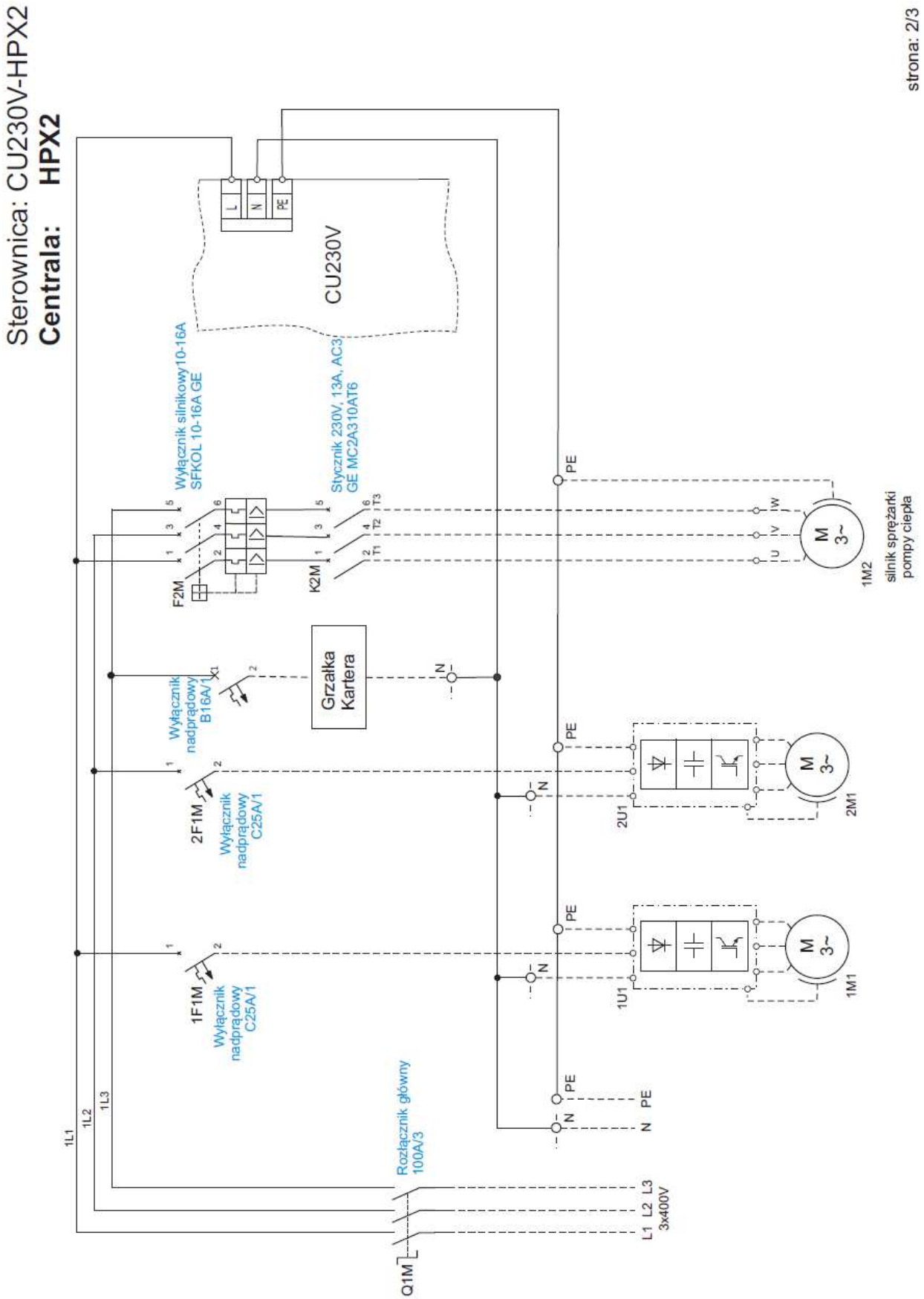
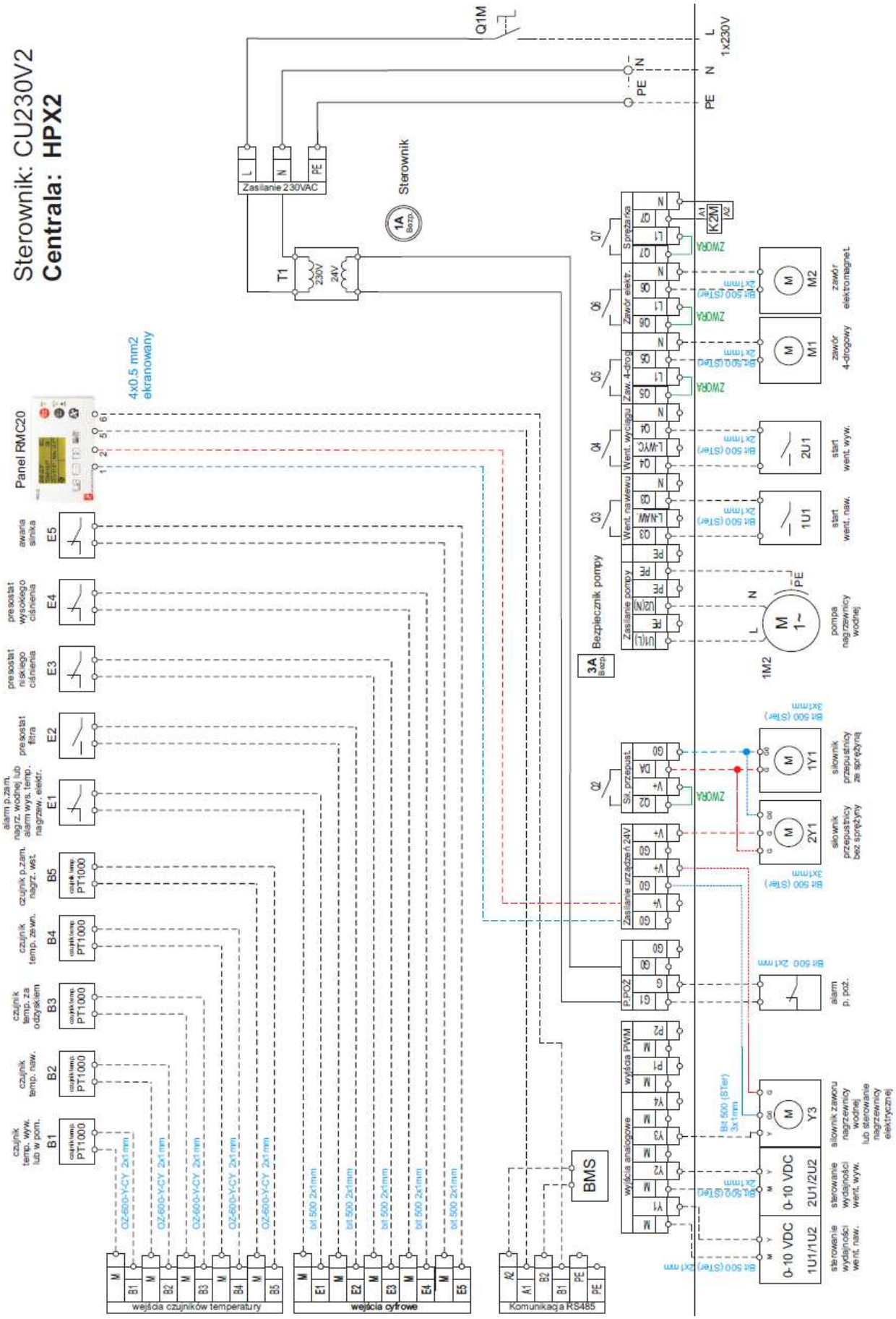
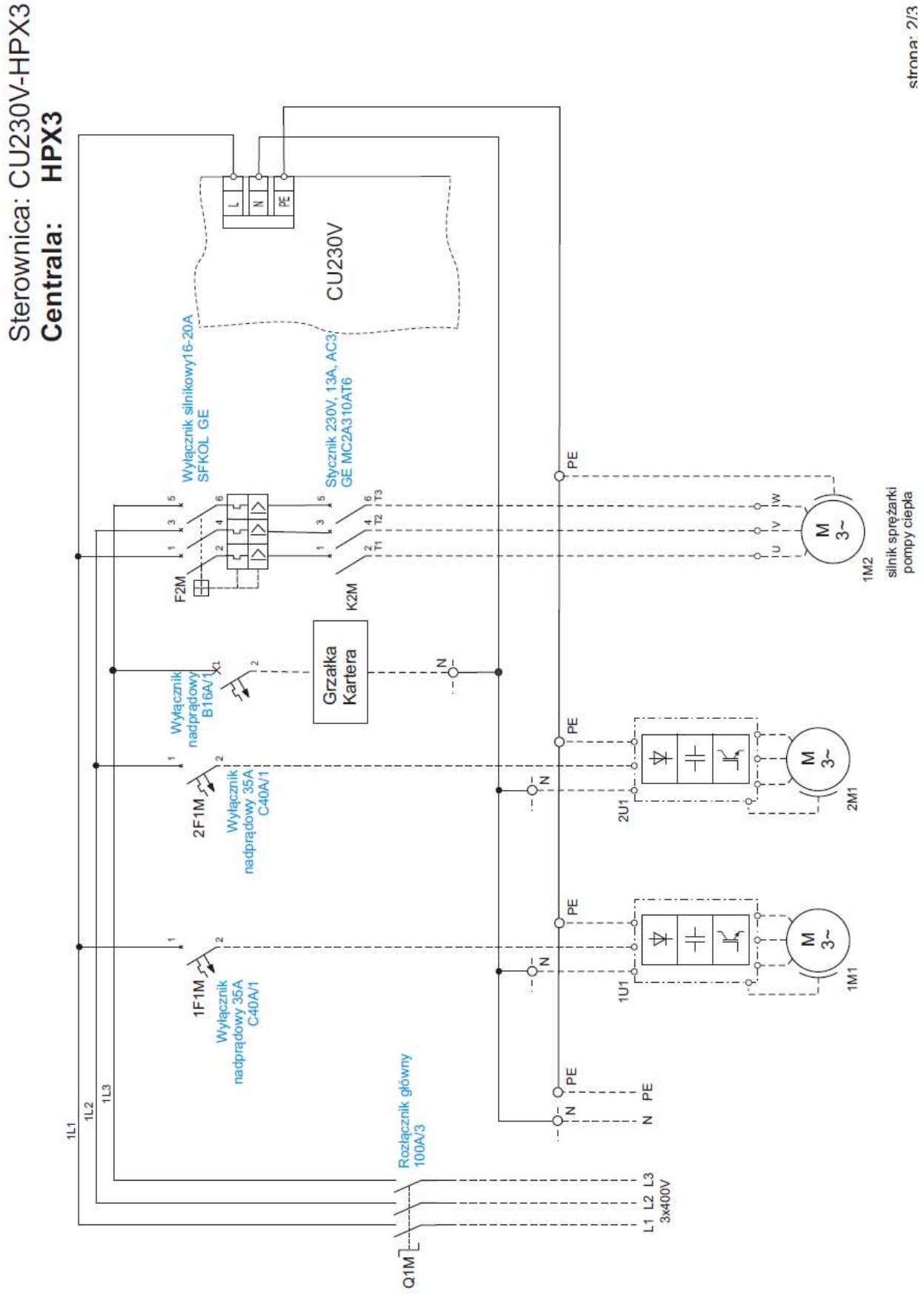


Figure no. 7.1 MCKT-HPX2 wiring diagram

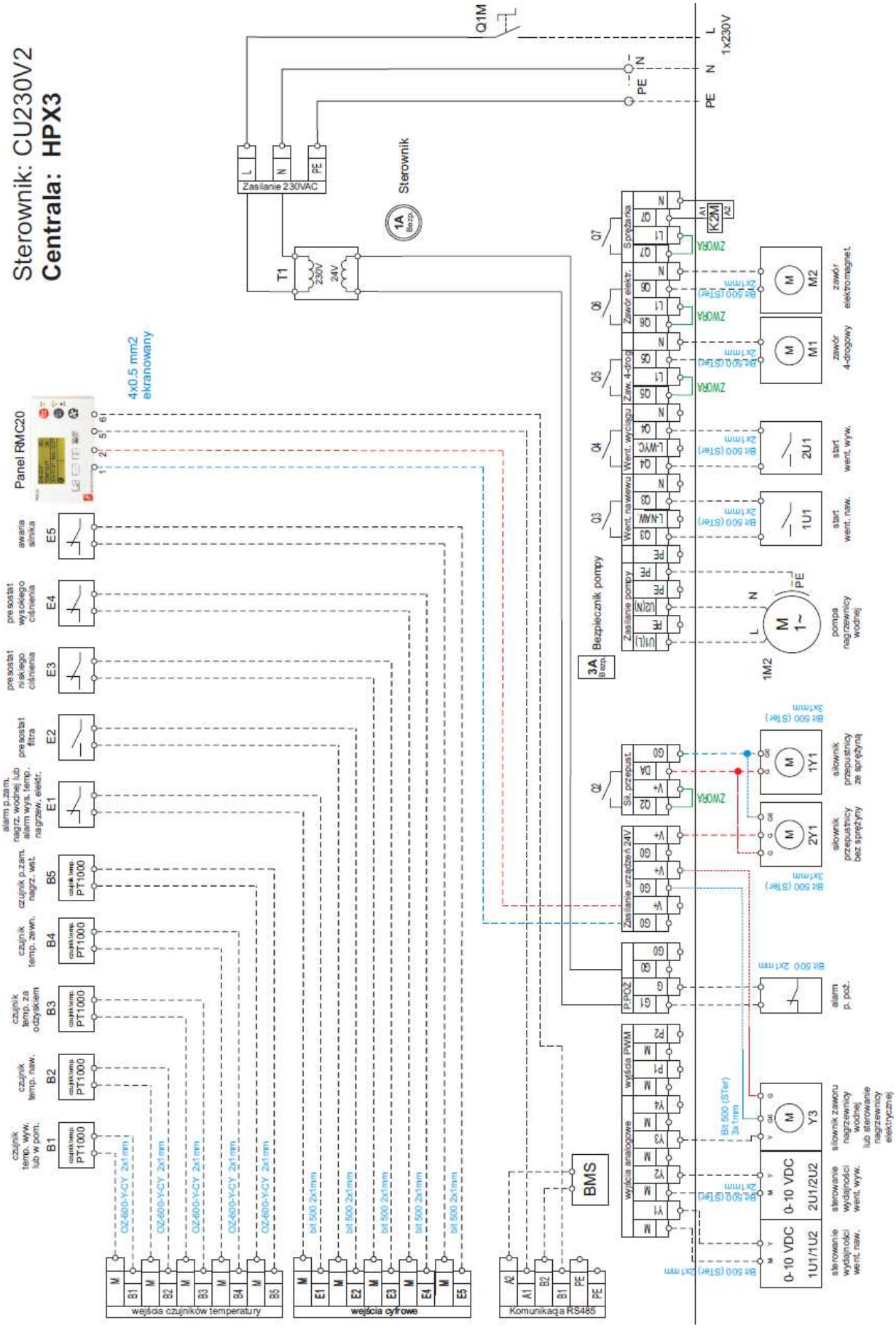


Picture no. 7.2 MCKT-HPX2 wiring diagram

6.4 Wiring diagram of MCKT-HPX3

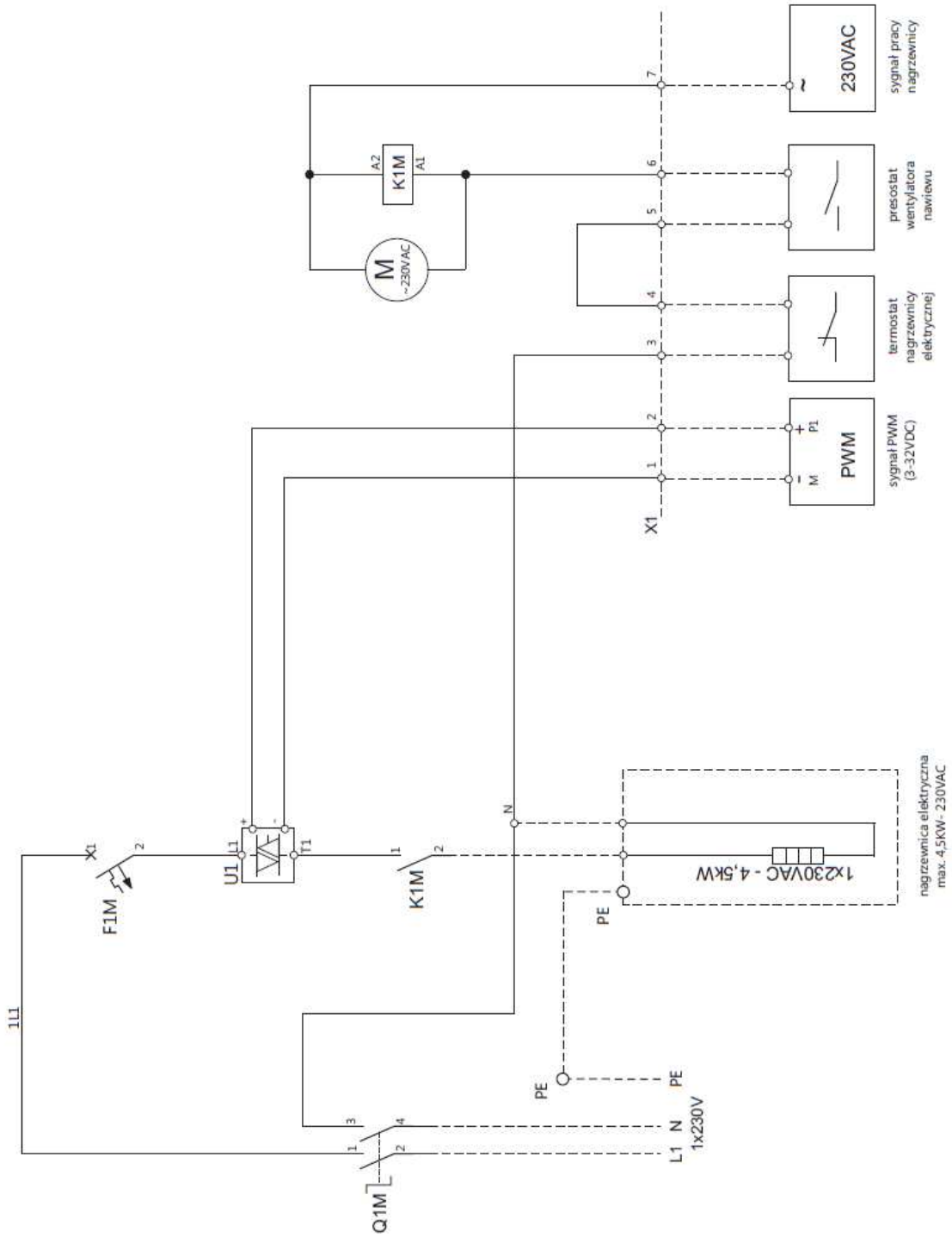


Picture no. 8.1 MCKT-HPX3 wiring diagram



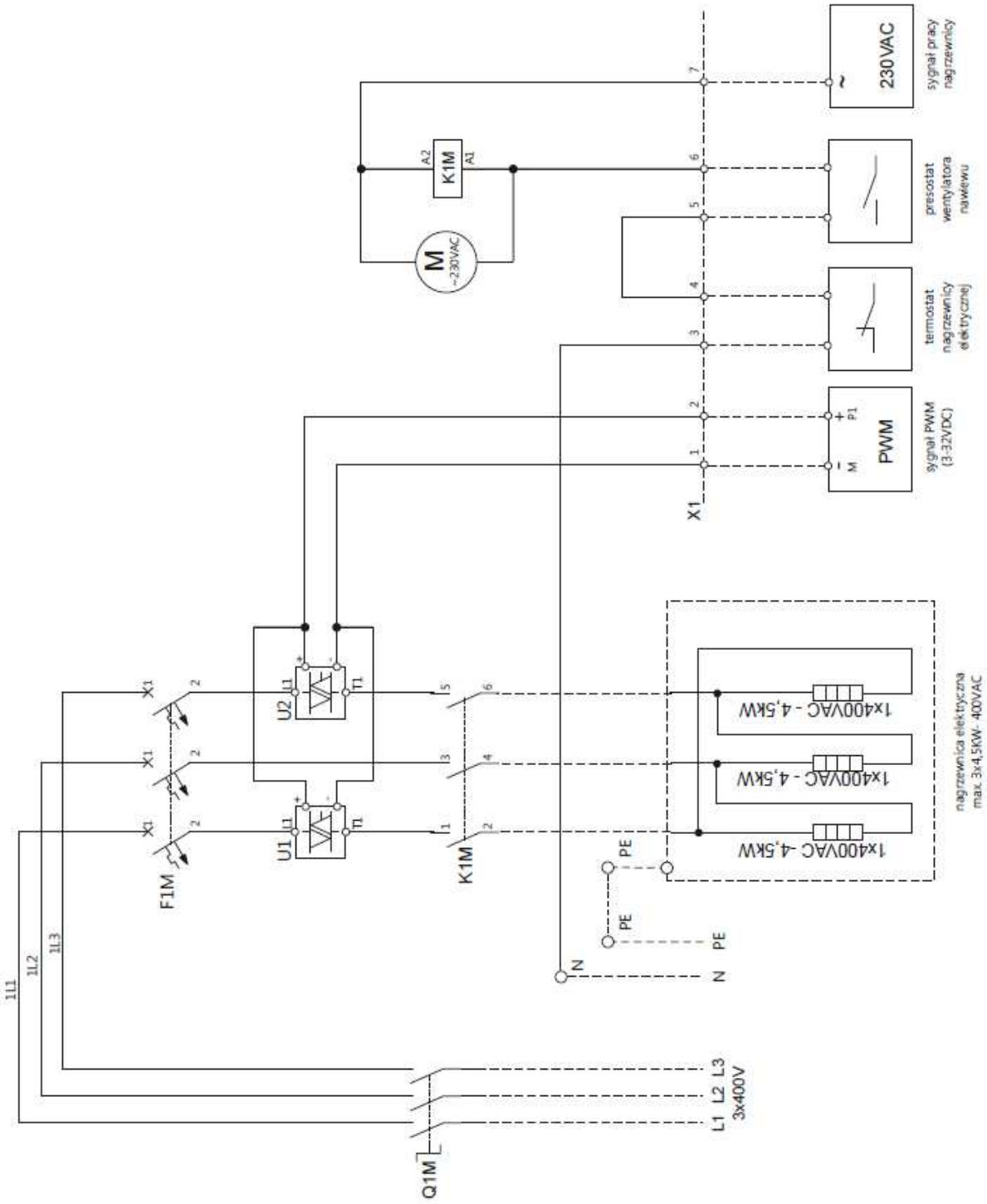
Picture no. 8.2 MCKT-HPX3 wiring diagram

6.5 Wiring diagram of MCKT-HPX1 electrical heater's power supply module



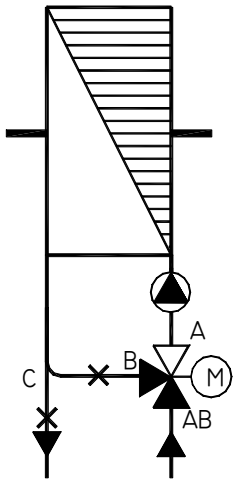
Picture no. 9 Wiring diagram of the 230V electrical heater control box for MCKT-HPX1

6.6 Wiring diagram of MCKT-HPX2 and 3 electrical heater's power supply module



Picture no. 10 Wiring diagram of the 400V electrical heater control box for MCKT-HPX2 and 3

6.7 DIAGRAM OF POWER SUPPLY NODE FOR THE PRELIMINARY WATER HEATER



Picture no. 11 Diagram of water heater node

Scope of Klimor delivery – mixing control valve with internal thread and 24VAC/DC actuator controlled by 0÷10V signal.
Other components highlighted on the diagram and necessary for correct node operation – to be provided by the buyer.

6.8 Danfoss FC 51 inverters for MCKT-HPX 2 and 3

Basic parameters for programming Danfoss FC 51 inverter
Settings for adjusting speed by analog 0–10V signal
Sample setting for the motor and the converter 0,75kW/1x230V

	Parameter no.	Parameter name	Entered data	Unit
QUICK MENU 1	120	Motor rated power	0.75	kW
	122	Motor rated voltage	400	V
	123	Motor rated frequency	50	Hz
	124	Rated motor current	2	A
	125	Motor rated RPM	1450	RPM
	129	Auto matching with AMT motor	Switch on [2]	*/
	302	Min set Hz value	10	Hz
	303	Max set Hz value	50	Hz
	341	Acceleration time in s from min to max Requested value	7	s
	342	Breaking time in s from min to max Requested value	7	s
MAIN MENU	190	Motor thermal protection	ETR Trip 1 [4]	
	412	Motor low speed limit in Hz	10	Hz
	414	Motor high speed limit in Hz	50	Hz
	416	Limit of torque in %	110	%
	610	Terminal 53 Low voltage level	0.07	V
	611	Terminal 53 High voltage level	10	V
	614	Terminal 53 Minimum set value	10	Hz
	615	Terminal 53 Maximum set value	50	Hz

*/ Once this parameter is set to function [2] the **PRESS HAND START** message appear in the display.

When the **HAND START** button on the control panel is pressed, the converter proceeds with the auto matching.

When the **auto matching** is complete, press **OK** on the control panel and the **parameter** is automatically set to [0] value. Now you can proceed with the programming.

The User Manual of the **FC 51** Inverter and the full programming manual can be found on the manufacturer's website:
http://www.danfoss.com/Poland/BusinessAreas/DrivesSolutions/frequency+converters/VLT+Micro+Drive.htm

6.9 BMS VARIABLE LIST

6.9.1 Register list with addresses (function 03, 06)

Protocol: MODBUS RTU

Note:

MODBUS address is an address which should appear directly in the MODBUS protocol frame.
Registers in the controller have got double MODBUS addresses. It concerns additional shared addresses in a 0-9999 range since not all visualization programs enable reading and writing addresses above 9999. In order to achieve the second register address, you need to deduct **55536** from a address listed in the table.

DESCRIPTION	Register	Address MODBUS
Alarms - bit packed Read and write *Alarm registers are 32-bit* *(see the register description in point 6.9.3)*	0 –…… 1 – R1H: current alarm condition – older register…… 2 – R1L: current alarm condition – newer register……	65280 65281 65282
Requested value	0 – Requested temperature for the secondary heater 3 – Fan speed…… Write – 5 values: 0 – speed according to the controller setting 1 – speed 1…… 2 – speed 2…… 3 – speed 3…… 4 – speed 4…… Read – 4 values: 0 – speed 1…… 1 – speed 2…… 3 – speed 3…… 4 – speed 4…… 4 – Operation mode Write – 3 values: 0 – Operation mode according to the regulator setting 1 – AUTOMATIC 2 – MANUAL Read – 2 values: 0 – AUTOMATIC 1 – MANUAL 5 – Requested temperature for the preliminary heater 7 – Fan rotary speed	65216 65219 65220 65221 65223
Unit operation condition	0 – register 1 1 – register 2	65152 65153
Temperature read *REMARKS:* *1. Measured values are expressed with 1/10 accuracy. Insert a comma manually once the value is read.* *E.g. once the 257 number is read it should be interpreted as 25,7* *2. 0xFFFF means that this parameter is not configured (does not exist)*	0 – Room temperature 3 – Air supply temperature 6 – External temperature 8 – Temperature at exchanger outlet 25 – GWC temperature	 64896 64899 64902 64904 64921
Start/Stop command and system operation condition	0 – Start/Stop command Write: Start=0x00AA, Stop=0x0055 Read: System operation condition 0 – system turned off by an operator 1 – system turned off due to operation in ECO mode 2 – system turned off by the clock 3 - 4 - 5 – system turned on	64640
Alarms are not bit-packed – write only (one register per each alarm) Writing the 170 (0xAA) value under the 64576 base address resets all alarms. Write the 170 value under appropriate address to reset single alarms.	0: General alarm (indicates alarm condition) 1: A1 – Heater anti-freeze alarm 2: A2 – Motor alarm (thermal protection) 3: A3 – No compression for air supply fan 4: A4 – No compression for air exhaust fan 5: A5 – Fire alarm 6: A6 – High temperature 7: A7 – Exchanger alarm *8:* A8 – Refrigerating unit anti-freeze alarm 9: A9 – Pump failure 10: FLT – Contaminated filters 18: A18 – Sensor error 22: A22 – Low pressure compressor 23: A23 – High pressure compressor	64576 64577 64578 64579 64580 64581 64582 64583 64584 64585 64586 64594 64598 64599

6.9.2 Register description – unit operation condition

Register 1

Bit no.	Process	Availability
0	Quick increase of requested value – regulator 2, loop 1	No
1	Quick increase of requested value – regulator 2, loop 2	No
2	Quick increase of requested value – regulator 3, loop 1	No
3	Quick increase of requested value – regulator 3, loop 2	No
4	Quick increase of requested value – humidification	No
5	Quick increase of requested value – dehumidification	No
6	Delay at start	
7	Delay at stop	
8-10	System condition: 0 – system turned off by an operator 1 – system turned off due to operation in ECO mode 2 – system turned off by the clock 3 - 4 - 5 – system turned on	
11	Valve setting before starting control	No
12	Pump testing	No
13	Preliminary heater temperature adjustment – heating	
14	Preliminary heater temperature adjustment – cooling	No
15	Exchanger defrosting	

Register 2

Bit no.	Process	Availability
0	Primary heating – room temperature adjustment	
1	Secondary heating	No
2	Cooling – room temperature adjustment	
3	Temperature adjustment at the exchanger outlet – heating	
4	Temperature adjustment at the exchanger outlet – cooling	No
5	Humidification	No
6	Dehumidification	No
7	Exchanger	
8	Bypass	No
9	GHEX	No
10	Air supply fan	
11	Air exhaust fan	
12	FREE COOLING	No
13	Preliminary heating	
14	Quick heating	No
15	Quick cooling	No

0 – OFF

1 – ON

6.9.3 Description of R1H, R1L alarm registers

RH – Register 1 (older register)

Bit no.	Alarm	Symbol	Availability
0	Humidification adjustment error	RH+	No
1	Dehumidification adjustment error	RH-	No
2	Water temperature too low	A19	No
3	Sensor error	A20	
4	-		
5	Low pressure compressor	A22	
6	High pressure compressor	A23	
7..15			

RL – Register 2 (newer register)

Bit no.	Alarm	Symbol	Availability
0	Heater anti-freeze alarm	A1	
1	Motor alarm (thermal protection)	A2	No
2	No compression for air supply fan	A3	
3	No compression for air exhaust fan	A4	No
4	Fire alarm	A5	No
5	High temperature	A6	
6	Exchanger alarm	A7	
7	Refrigerating unit anti-freeze alarm	A8	No
8	Pump failure	A9	No
9	Contaminated filters	A10	
10	Heating adjustment error	R1+	No
11	Cooling adjustment error	R1-	No
12	Adjustment error – regulator 2, loop 1	R2+	No
13	Adjustment error – regulator 2, loop 2	R2-	No
14	Adjustment error – regulator 3, loop 1	R3+	No
15	Adjustment error – regulator 3, loop 2	R3-	No

6.10 CONVERTER OPERATION

A converter with integrated HTTP server enables remote control of the MCKT-HPX AHU using a smartphone, tablet or PC. Communication with the AHU is realized via Internet web page containing visualization which enables unit management almost from any place with Internet access. You can connect with the system using iPhone, iPad and a terminal with Android or Windows system. The interface detects a terminal type and adopts to it automatically.
The web page can be accessed using various web browsers, such as Firefox, Chrome, Safari, etc.

6.10.1 Connecting the converter

The converter is installed in the AHU, near the electrical switchboard and is connected to the AHU controller. Make sure to connect it using a Ethernet cable to an appropriate Ethernet port in the facility.

6.10.2 Converter settings

Enter the converter's IP address in order to open its web page. During first login the login window opens. Please enter an appropriate login name and password. Once logged in the main page appears. It enables reviewing and editing the controller parameters, such as alarms, measured temperature values, requested (set) values or time schedule settings. These parameters are refreshed automatically and the refresh cycle of all variables is 30 seconds.
At the bottom of the page you can find the ETHERNET and MODBUS configuration options.
The ETHERNET CONNECTION and MODBUS CONNECTION indicate current connection condition.
If the ETHERNET CONNECTION lights green, the controller parameters are transferred live to the web page. Red indication means that connection with server is lost.
If the MODBUS CONNECTION lights green, communication between the controller and converter is correct. Red indication means that the device cannot read data from the controller. It may be caused by missing RS485 connection or wrong configuration of data transmission parameters, such as baud rate or frame format.

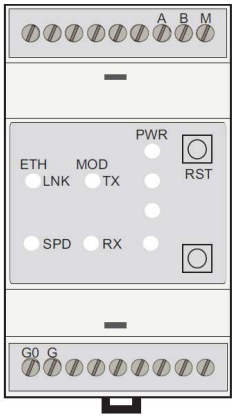
Click the ETHERNET CONFIGURATION button to open new window, where you can change the converter IP settings. Click the SAVE CHANGES button to send new settings to the converter. They will become active AFTER RESET using the RESET button on the web page.

Click the MODBUS CONFIGURATION button to open new window, where you can edit MODBUS transmission parameters, such as baud rate, frame format RTU or ASC II mode and Slave address of the controller. The delay parameter changes break time between consecutive series of queries regarding the controller parameter value. As in case of the ETHERNET configuration new MODBUS settings become active after the RESET.

6.10.3 Converter description

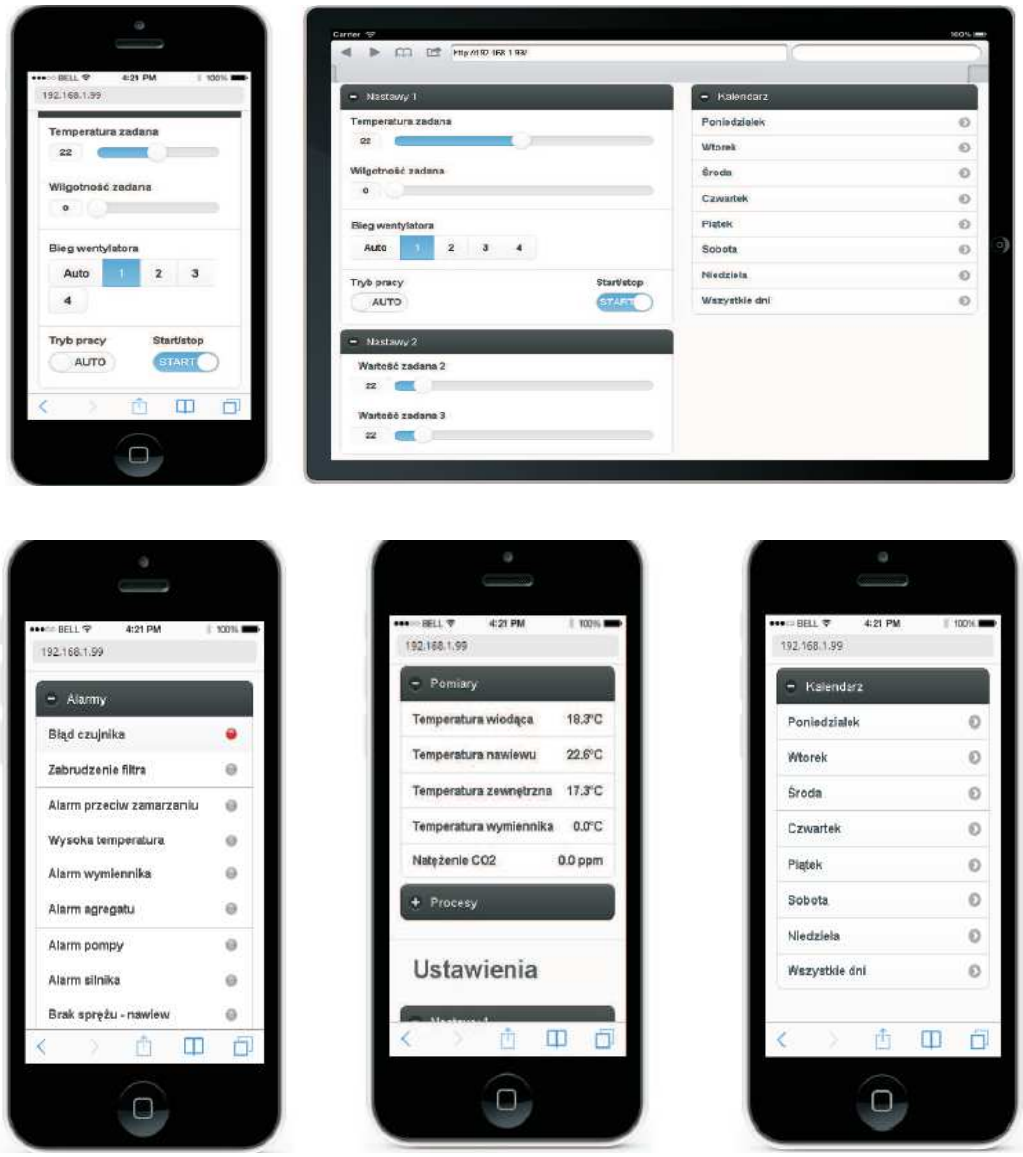
Symbol description

1. G0 and G – 24V power supply
2. A, B RS485 serial connector
3. PWR – power indicator
4. LNK, SPD – ETHERNET connection indicator
5. TX, RX – MODBUS connection indicator
6. RST – RESET button resetting to factory settings, i.e. IP address and MODBUS settings (ASC II, 9600 baud, 8 data bits, 1 stop bit, no parity)



Picture no. 12 Converter

6.10.4 Interface page view on iPhone and iPad – examples



Picture no. 13 Application screens – examples